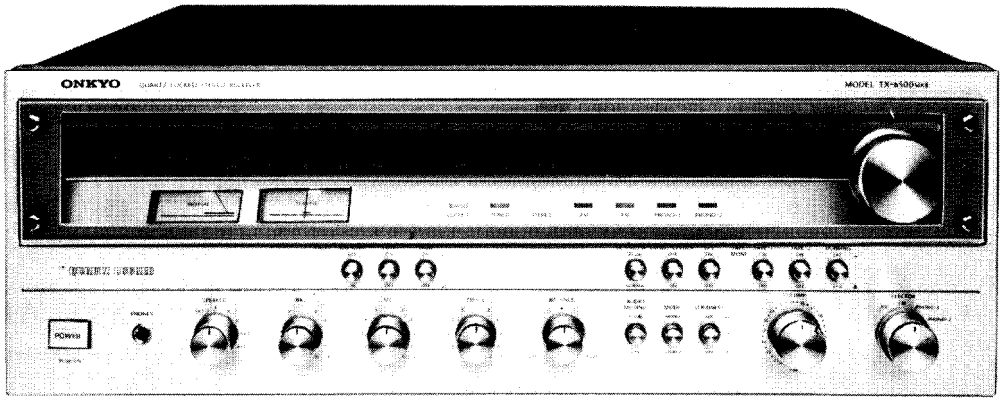
ONKYO® SERVICE MANUAL

QUARTZ LOCKED STEREO RECEIVER Model TX-6500MKII



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ONKYO®
AUDIO COMPONENTS

SPECIFICATIONS

Amplifier section

Power Output:	100 watts per channel, min. RMS, at 8 ohms both channels driven, from 20Hz to 20kHz, with no more than 0.05% total harmonic distortion.	
Total Harmonic Distortion:	0.05% at rated power 0.04% at 1 watt, 8 ohms	
IM Distortion:	0.1% at rated power 0.08% at 1 watt, 8 ohms	
Damping Factor:	50 (8 ohms, 1kHz)	
Frequency Response:	3~30,000Hz (±1dB through TAPE) 1~80,000Hz (±1dB at power amplifier)	
Tilt:	better than 5% at 50Hz (through TAPE)	
Sensitivity and Impedance:	PHONO:	2.5mV 50 kohms
	TAPE PLAY:	150mV 50 ohms
	TAPE REC:	150mV 3.5 kohms (PHONO)
	EPS OUT:	150mV 3.5 kohms (PHONO)
	EPS IN:	150mV 50 kohms
	PRE OUT:	1V 2.2 kohms
	MAIN IN:	1V 50 kohms
Phono Overload:	200mV RMS at 1kHz 0.05% THD.	
Tone Controls:	TREBLE:	±10dB at 10kHz
	MID:	±5dB at 1kHz
	BASS:	±12dB at 100Hz
Signal to Noise Ratio:	PHONO:	65dB (IHF C) 87dB (IHF A 10mV input)
	TAPE PLAY:	90dB (IHF C) 95dB (IHF A)
RIAA Curve Deviation:	±0.2dB (30Hz to 15kHz)	
Filters:	HIGH:	6kHz (12dB/oct.)
	LOW:	100Hz (12dB/oct.)
	SUBSONIC:	6Hz (6dB/oct.)
Loudness: (−26dB)	+5.5dB at 40Hz +5dB at 20kHz	
Audio Muting:	−20dB	

Tuner section

Tuning Range:	FM:	88~108MHz
	AM:	530~1605kHz
Usable Sensitivity:	FM mono:	9.8dBf, 1.7μV IHF
	FM stereo:	17.2dBf, 4μV IHF
	AM:	25μV
50dB Quieting Sensitivity:	FM mono:	14.7dBf, 3μV
	FM stereo:	36dBf, 35μV
Intermediate Frequency:	FM:	10.7MHz
	AM:	455kHz
Capture Ratio:	FM:	1.3dB
Image Rejecion Ratio:	FM:	85dB
	AM:	60dB
IF Rejection Ratio:	FM:	100dB
	AM:	55dB
Spurious Rejection:	FM 1/2 IF:	95dB
Signal to Noise Ratio:	FM mono:	70dB
	FM stereo:	65dB
	AM:	45dB
ACA:	FM:	70dB
AM Suppression Ratio:	FM:	55dB
Harmonic Distortion:	FM mono:	0.15%
	FM stereo:	0.3%
	AM:	0.7%
Frequency Response:	FM:	30~15,000Hz±1.5dB
Stereo Separation:	FM:	40dB at 1kHz 35dB at 100~10,000Hz
Muting Level:	FM:	17.2dBf, 4μV
Stereo Threshold:	FM:	17.2dBf, 4μV
Quartz Lock Level:	FM:	17.2dBf, 4μV
Subb Carrier Suppression:	FM:	60dB

General

Power Supply:	AC 220 volts 50Hz or AC120volts 60Hz
Dimensions:	538W x 187H x 435D mm. 21-3/16" x 7-3/8" x 17-1/8"
Weight:	22kg. 48.4 lbs.
Semiconductors:	7 FETs, 9 ICs, 66 Transistors, 42 Diodes

Specifications and features are subject to change without notice.

PRECAUTIONS

1. For continued protection against fire hazard, replace only with same type and same rating fuse.

		PARTS NO.
AC fuse	8A (ST-6)	252053 (120V model)
	5A-T	252020 (220V model)
Lamp fuse	4A-T	252014

2. Replacement for power, complementary and driver transistors, if necessary, must be made from the same beta (h_{FE}) group as the original type.
3. Always disconnect the chassis from power line when soldering.
   Turning the power switch OFF is not enough.
   Power line leakage passing through the heating element may destroy the transistors.

SERVICE PROCEDURES

1. CHECKING POWER AMPLI. PC BOARD

1) Remove four screws holding top cover and side bracket.
2) Remove four screws holding back chassis and radiator.
3) Remove four screws holding power ampli. pc board and radiator.

2. CHECKING TUNER PC BOARD

1) Remove the top cover.
2) Remove the bottom baord.
3) Remove four screws holding front chassis and protection pc board bracket.

3. REMOVEMENT OF THE FRONT PANEL

1) Remove the top cover.
2) Remove five screws holding front panel and front bracket.
3) Loosen a enamel screw on the tuning shaft and pull out the tuning knob.
4) Pull out the control knobs. (SPEAKERS/BASS/MID/TREBLE/BALANCE/VOLUME/SELECTOR)

4. REMOVEMENT OF THE DIAL GLASS

1) Remove four screws holding dial glass and front panel.
   NOTES: The dial glass has been mounted by applying an 800 gr torque to the screws. If the dial glass is removed during repairs, and a torque driver is available, apply 800 gr torque to the screws when replacing. If however, a torque driver is not available, simply tighten the screws by hand. When replacing the dial glass, insert all relevant component parts in accordance with the cross sectional diagram.

5. REPLACING METER

1) Remove the top cover and front panel.
2) Remove the two screws secring the illumination bracket and front bracket.
3) Remove the pointer from the front bracket.
4) Remove the 2 sets of screws secring the left and right lamp covers and dial plate covers to the front bracket.
5) Move the front panel out, keeping the dial plate cover held against the dial plate, and remove the 2 (left and right) lamp pc boards.
   Then remove the dial plate from the drive shaft.
6) Remove the 3 screws secring the front cover to the back plate.
7) The top sides of the meter covers are fastened to the back plate by adhesive tape.
   Remove this tape, taking care not to jar or knock the meters.

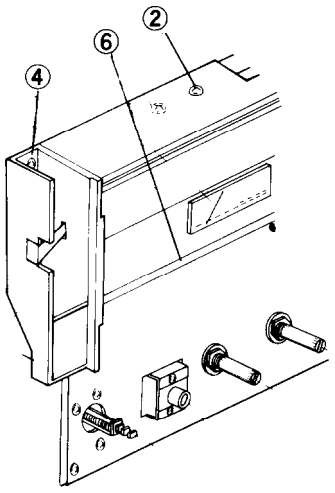

Fig. 1

6. SENSOR SWITCH

For matching the automatic FM tuning quartz lock system to the various operating conditions. Set to LOW initially and switch to NORMAL or HIGH if the TUNED lamp does not turn off as soon as the tuning knob is touched.

7. CHECKING INPUT/OUTPUT TERMINAL

1) Remove the top cover and right channel power ampli pc board.
2) Remove three screws shielded case and back panel.

COMPONENT LOCATION

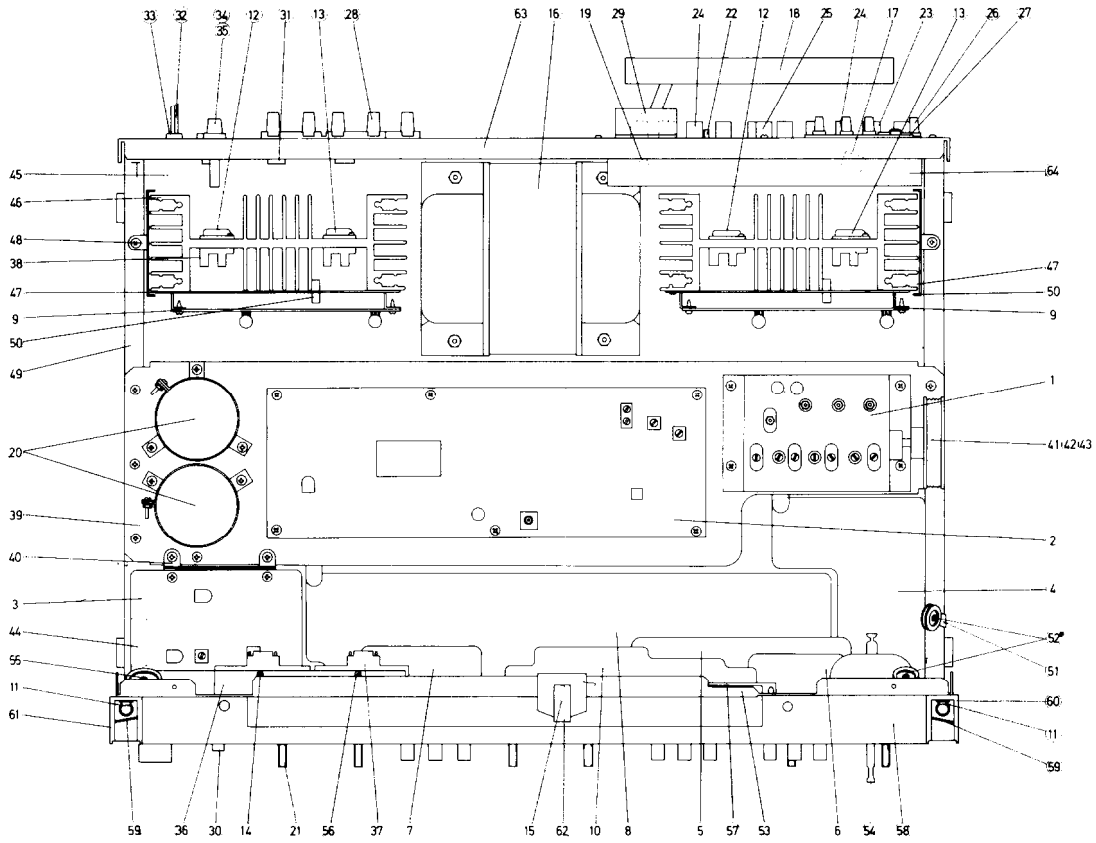

Fig. 2

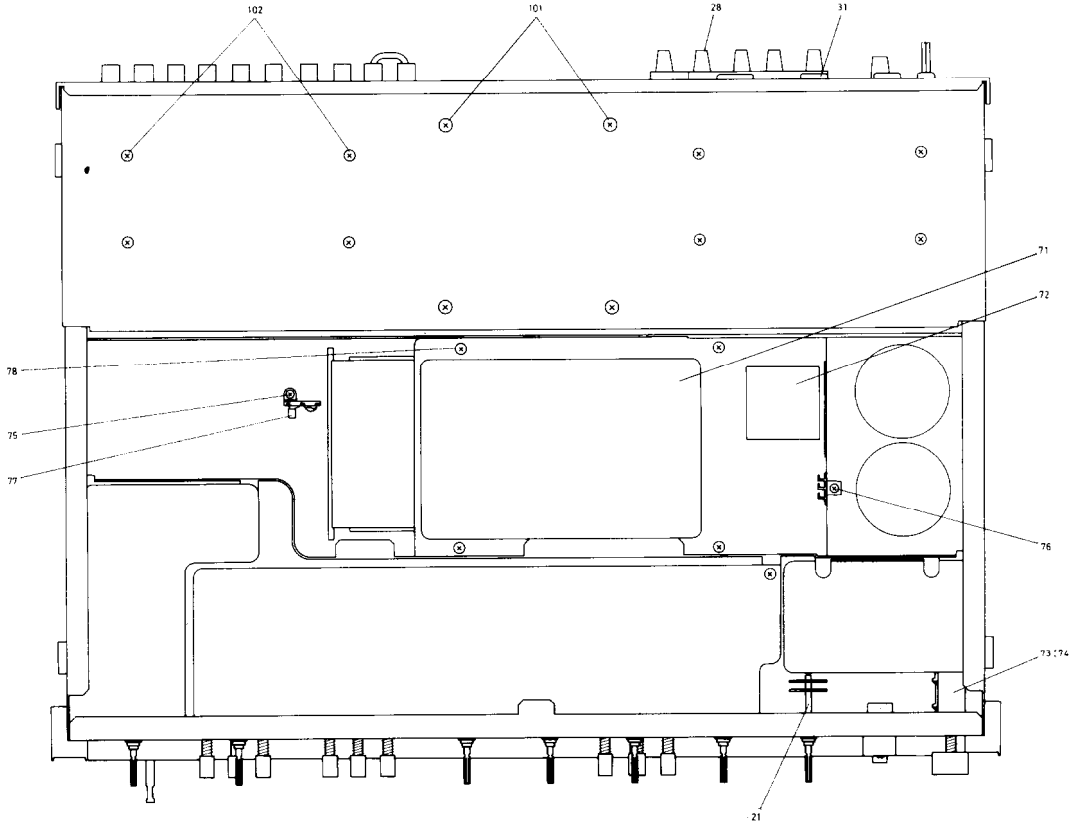

Fig. 3

COMPONENT LOCATION-PARTS LIST

U.S.A. Model

REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION
1	U1	240037	FAT-52EJ-41, FM front end
2	U2	13699575A	NAIM-475a, AM/FM tuner p.c.b.
3	U3	13709576	NAXL-476, Quartz locked circuit p.c.b.
4	U4	13699596	NAEQ-496, Equalizer ampli. p.c.b.
5	U5	13699597	NASW-497, Switch p.c.b.
6	U6	13699598	NASW-498, Switch p.c.b.
7	U7	13699599	NASW-499, Switch p.c.b.
8	U8	13699500	NAAF-500, Preampli. p.c.b.
9	U9, U10	13699501	NADA-501, Power ampli. p.c.b.
10	U12	13699503	NAPL-503, Indicator lamp p.c.b.
11	U13, U14	13719574	NAPL-474, Dial illumination lamp p.c.b.
12	Q511, Q512	2200802	2SD551(R) or 2SD551(O) Power ampli. transistor
	Q611, Q612	2200803 or	
13	Q513, Q514	2200812	2SB681(R) or 2SB681(O) Power ampli. transistor
	Q613, Q614	2200813 or	
14	PL803, PL804	210041	PL8V0.15AW-2, Meter illumination lamp
15	PL805	210044	PL8V0.05AW-3, Pointer lamp
16	T901	230247	NPT-642D, Power transformer
17	T001	233026	NBLN-1, Balun transformer
18	L001	232066	NMA-3012, Antenna coil (bar antenna)
19	L002	233105	NCH-1005
		233024 or	NCCH-1501 or Choke coil
20	C903, C904	3504109	24,000μF, 63V, Elect. capacitor
21	S815	25030077	NRS-266-30YW, Speaker selector switch
22	S816	25065016	NSS-2327, Sensor switch
23	P801	25045044	NPJ-4PRBL21, Phono input terminal
24	P802, P803	25045025	NPJ-4PRBL03, Tape input/output terminal
	P804, P805		EPS input/output terminal, Pre. output, main input terminal
25	P806	250256A	NTM-1WPBL-E1, 4ch. detector output terminal
26	P813	25060008	Ground terminal
27	P809	25060021B	NTM-3PUM1, Antenna terminal
28	P810-P812	25060029	NTM-4PRMN05, Speaker terminal
29	P814	25055015	Connection bar
30	P815	25045018	LJ-100-H, Stereo headphone jack
31	P901-P903	25050032	S-I6444-01, AC outlet terminal
32	W901	253099	AS-UC-3, Power supply cord
33	W901a	270025	SR-3P-4, Strainrelief
34	F901	252053	8A-ST-6, AC fuse
35	F901a	250080	S-N1301, Fuse holder
36	M801	243086	NIND-0500S86, Signal strength meter
37	M802	243087	NIND-0250S87, Center tuning meter
38	Q511a	250249	M-1614, Power ampli. transistor socket
39	A001	27100030	Front chassis
40	A003	27140211	PC bracket
41	A005	27200020	Dial drum
42	A006	273803	SP-14A, Dial drum spring
43	A007	273903	Stringing
44	A018	28140104	Cushion
45	A031	27100031	Back chassis
46	A032	27160040	Radiator
47	A033	27150084	Shielded case
48	A034	27130132A	Bracket for radiator
49	A054	27115034	Side bracket
50	A036	27140212	Transistor case
51	A055	27140233	Bracket for dial pulley
52	A056	27185002	DP-16N, Dial pulley
53	A061	27110061A	Front bracket
54	A062	27205012	Drive shaft
55	A064	27185001	DP-26N, Dial pulley
56	A066	27300114	Cushion
57	A067	27190033	Lamp holder
58	A071	27240016A	Illumination bracket
59	A085	27140203	Spring plate
60	A084	27215030	Frame (R)
61	A083	27215031	Frame (L)
62	A087	27220009	Pointer slider
63	A105	27120122	Back panel
64	A107	27225028	Shielded case
71	U11	13719574	NAPS-502, Protection and rectifier p.c.b.
72	D901	223852	S5188, Silicon diode
73	S901	25035015	NPS-111LA3, Power switch
74	C901	3504012	UL125V103M, UL capacitor
75	P817	251070	LG-2C, Terminal
76		250130	T-4461, Ground terminal
77	C165	352743301	33μF, 16V, Elect. capacitor
78	A002	27130131	Bracket for power supply p.c.b.

Europe Model

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1	U1	240037	FAT-52EJ-41, FM front end
2	U2	13699575A	NAIM-475a, AM/FM tuner p.c.b.
3	U3	13709576	NAXL-476, Quartz locked circuit p.c.b.
4	U4	13699596	NAEQ-496, Equalizer ampli. p.c.b.
5	U5	13702597A	NASW-497a, Switch p.c.b.
6	U6	13699598	NASW-498, Switch p.c.b.
7	U7	13699599	NASW-499, Switch p.c.b.
8	U8	13699500	NAAF-500, Preampli. p.c.b.
9	U9, U10	13699501	NADA-501, Power ampli. p.c.b.
10	U12	13699503	NAPL-503, Indicator lamp p.c.b.
11	U13, U14	13719574	NAPL-474, Dial illumination lamp p.c.b.
12	Q511, Q512	2200802	2SD551(R) or 2SD551(O) Power ampli. transistor
	Q611, Q612	2200803 or	
13	Q513, Q514	2200812	2SB681(R) or 2SB681(O) Power ampli. transistor
	Q613, Q614	2200813 or	
14	PL803, PL804	210041	PL8V0.15AW-2, Meter illumination lamp
15	PL805	210044	PL8V0.05AW-3, Pointer lamp
16	T901	230248	NPT-642G, Power transformer
17	T001	233026	NBLN-1, Balun transformer
18	L001	232066	NMA-3012, Antenna coil (bar antenna)
19	L002	233105	NCH-1005
		233024 or	NCCH-1501 or Choke coil
20	C903, C904	3504109	24, 000μF, 63V, Elect. capacitor
21	S815	25030077	NRS-266-30YW, Speaker selector switch
22	S816	25065016	NSS-2327, Sensor switch
23	P801	25045044	NPJ-4PRBL21, Phono input terminal
24	P802, P803	25045025	NPJ-4PRBL03, Tape input/output terminal
	P804, P805		EPS input/output terminal, Pre. output, main input terminal
25	P806	250256A	NTM-1WPBL-E1, 4ch. detector output terminal
26	P813	25060008	Ground terminal
27	P809	25060021B	NTM-3PUM1, Antenna terminal
28	P810-P812	25060029	NTM-4PRMN05, Speaker terminal
29	P814	25055015	Connection bar
30	P815	25045018	LJ-100-H, Stereo headphone jack
31	P901-P903	25050032	S-I6444-01, AC outlet terminal
32	W901	253088	AS-VDE-1, Power supply cord
33	W901a	25065018	Stopper for 32
34	F901	252020	5A-T, AC fuse
35	F901a	250080	S-N1301, Fuse holder
36	M801	243086	NIND-0500S86, Signal strength meter
37	M802	243087	NIND-0250S87, Center tuning meter
38	Q511a	250249	M-1614, Power ampli. transistor socket
39	A001	27100030	Front chassis
40	A003	27140211	PC bracket
41	A005	27200020	Dial drum
42	A006	273803	SP-14A, Dial drum spring
43	A007	273903	Stringing
44	A018	28140104	Cushion
45	A031	27100031	Back chassis
46	A032	27160040	Radiator
47	A033	27150084	Shielded case
48	A034	27130132A	Bracket for radiator
49	A054	27115034	Side bracket
50	A036	27140212	Transistor case
51	A055	27140233	Bracket for dial pulley
52	A056	27185002	DP-16N, Dial pulley
53	A061	27110061A	Front bracket
54	A062	27205012	Drive shaft
55	A064	27185001	DP-26N, Dial pulley
56	A066	27300114	Cushion
57	A067	27190033	Lamp holder
58	A071	27240016A	Illumination bracket
59	A085	27140203	Spring plate
60	A084	27215030	Frame (R)
61	A083	27215031	Frame (L)
62	A087	27220009	Pointer slider
63	A105	27120123	Back panel
64	A107	27225028	Shielded case
71	U11	13719574	NAPS-502, Protection and rectifier p.c.b.
72	D901	223852	S5188, Silicon diode
73	S901	25035051	NPS-121L16P, Power switch
74	C901, C902	3500052	PME-271Y510CEE, IS capacitor
75	P817	251070	LG-2C, Terminal
76		250130	T-4461, Ground terminal
77	C165	352743301	33μF, 16V, Elect. capacitor
78	A002	27130131	Bracket for power supply p.c.b.

EXPLODED VIEW

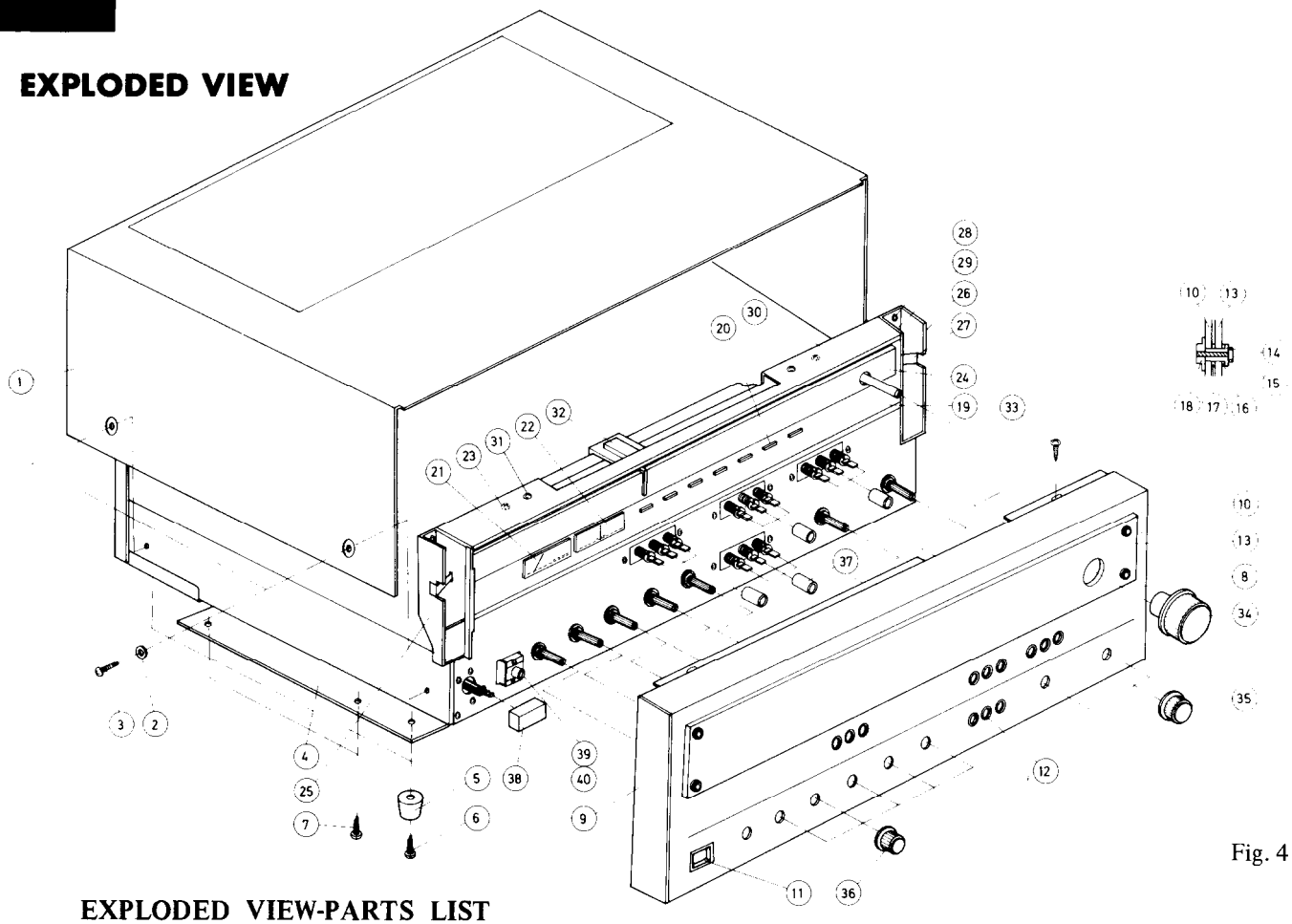


Fig. 4

EXPLODED VIEW-PARTS LIST

U.S.A. Model

REF. NO.	PARTS NO.	DESCRIPTION
1	28110141	Top cover
2	838440109	4TTB+10C (BC), Screw
3	87644012	W4x12F (BC), Washer
4	27170044	Bottom board
5	280889	Leg
6	831130162	3STW+16BQ, Screw
7	831130082	3STW+8BQ, Screw
8	13699121-1	Front panel ass'y (8-12)
8	27210099	Front panel
9	28125051A	End cap (L)
10	28125050A	End cap (R)
11	27267027	Power switch guide
12	27267026	Push switch guide
13	28191027	Dial glass
14	27270014	Spacer
15	27300038	Screw
16	870051	Washer
17	870052	Washer
18	86213010	Nut
19	28133009A	Back plate
20	28198512	Facet
21	243086	NIND-0500S86, Strength meter
22	243087	NIND-0250S87, Center tuning meter
23	834130062	3STS+6BQ, Screw
24	28130067	Dial plate
25	27215031A	Lamp case (L)
26	27215030A	Lamp case (R)
27	27140203	Spring Plate
28	831130082	3STW+8BQ, Screw
29	13719574	Dial illumination p.c.b.
30	27240016A	Illumination bracket
31	834130062	3STS+6BQ, Screw
32	13719131	Pointer ass'y
33	834130062	3STS+6BQ, Screw
34	28320241	Tuning knob
35	28320238	Volume control knob
36	28320237	Tone control knob
37	28320239	Push switch knob
38	28320235	Power switch knob
39	441723314	330Ω, 2W, Metal oxide film resistor
40	25045018	LJ-100-H, Stereo headphone jack

Europe Model

REF. NO.	PARTS NO.	DESCRIPTION
1	28110142	Top cover
2	838240109	4TTB+10C (Ni), Screw
3	87624012	W4x12F (Ni), Washer
4	27170044	Bottom board
5	280889	Leg
6	831130162	3STW+16BQ, Screw
7	831130082	3STW+8BQ, Screw
8	13699121-1	Front panel ass'y (8-12)
8	27210099	Front panel
9	28125051A	End cap (L)
10	28125050A	End cap (R)
11	27267027	Power switch guide
12	27267026	Push switch guide
13	28191027	Dial glass
14	27270014	Spacer
15	27300038	Screw
16	870051	Washer
17	870052	Washer
18	86213010	Nut
19	28133009A	Back plate
20	28198512	Facet
21	243086	NIND-0500S86, Strength meter
22	243087	NIND-0250S87, Center tuning meter
23	834130062	3STS+6BQ, Screw
24	28130067	Dial plate
25	27215031A	Lamp case (L)
26	27215030A	Lamp case (R)
27	27140203	Spring Plate
28	831130082	3STW+8BQ, Screw
29	13719574	Dial illumination p.c.b.
30	27240016A	Illumination bracket
31	834130062	3STS+6BQ, Screw
32	13719131	Pointer ass'y
33	834130062	3STS+6BQ, Screw
34	28320241	Tuning knob
35	28320238	Volume control knob
36	28320237	Tone control knob
37	28320239	Push switch knob
38	28320235	Power switch knob
39	441723314	330Ω, 2W, Metal oxide film resistor
40	25045018	LJ-100-H, Stereo headphone jack

PACKING PROCEDURES

U.S.A. Model

Universal Model

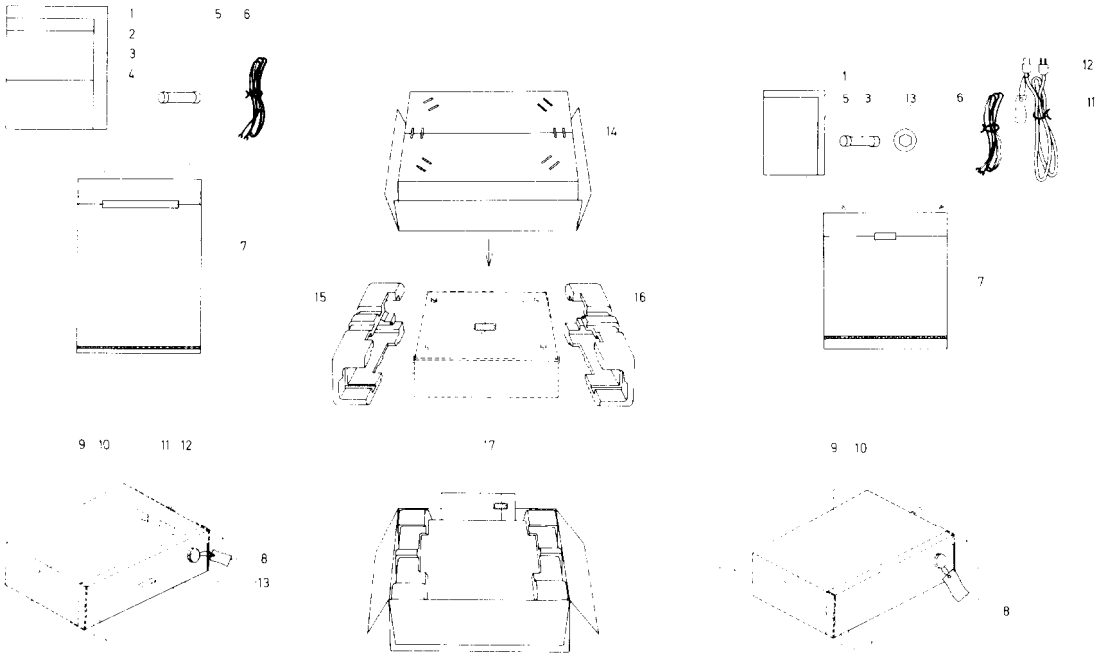


Fig. 5

1. Four shorted pins are inserted in the phono terminals.
2. All printed materials and accessory items are placed in the poly bag and taped.
3. The sensor tag is attached to the tuning knob.

PARTS LIST
U.S.A. Model

REF. NO.	PARTS NO.	DESCRIPTION
1	29340271	Instruction manual
2	29358001	Service station list
3	29355046	Caution card for 4
4	29365003	Warranty card
5	252053	8A (ST-6), Fuse
6	292064	5059-01, FM antenna
7	29100006	250 x 350mm, Poly bag
8	29355045	Sensor tag
9	29095085	670 x 1,200mm, Protection sheet
10	29100020	720 x 1,020mm, Poly bag
11	282969	Caution card A
12	29360209	Cabinet composite label
13	293041	Caution label
14	29050201	Carton box
15	29090288	Pad R
16	29090287	Pad L
17	13699119	Accessory bag complete
	250153	PO-107, Shorted pin

PARTS LIST
Europe Model

REF. NO.	PARTS NO.	DESCRIPTION
1	29340272	Instruction manual
3	252020	5A-T, Fuse
5	29380034	Sticker (U)
6	292064	5059-01, FM antenna
7	29100006	250 x 350mm, Poly bag
8	29355045	Sensor tag
9	29095085	670 x 1,200mm, Protection sheet
10	29100020	720 x 1,020mm, Poly bag
13	292075	Metal
14	29050201	Carton box
15	29090288	Pad R
16	29090287	Pad L
17	13704139	Accessory bag complete
	250153	PO-107, Shorted pin
	29365005	Warranty card (G)

(U) : Only Europe model

(G) : Only German model

BLOCK DIAGRAM

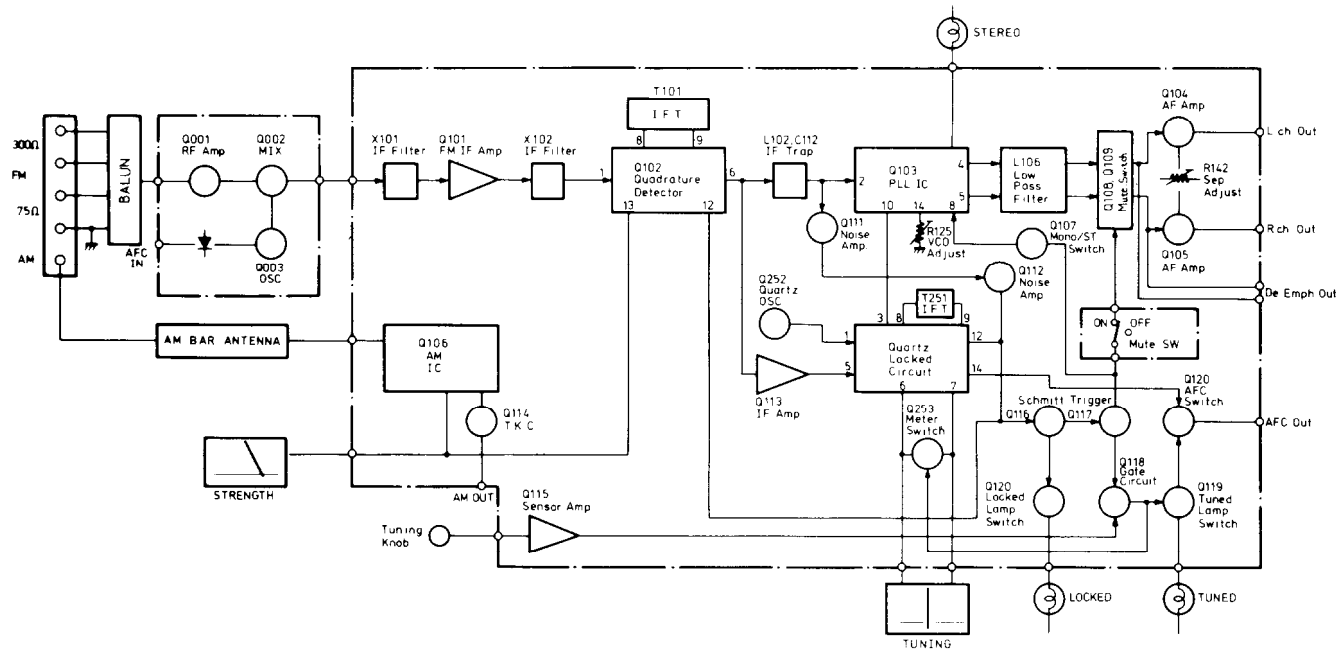


Fig. 6

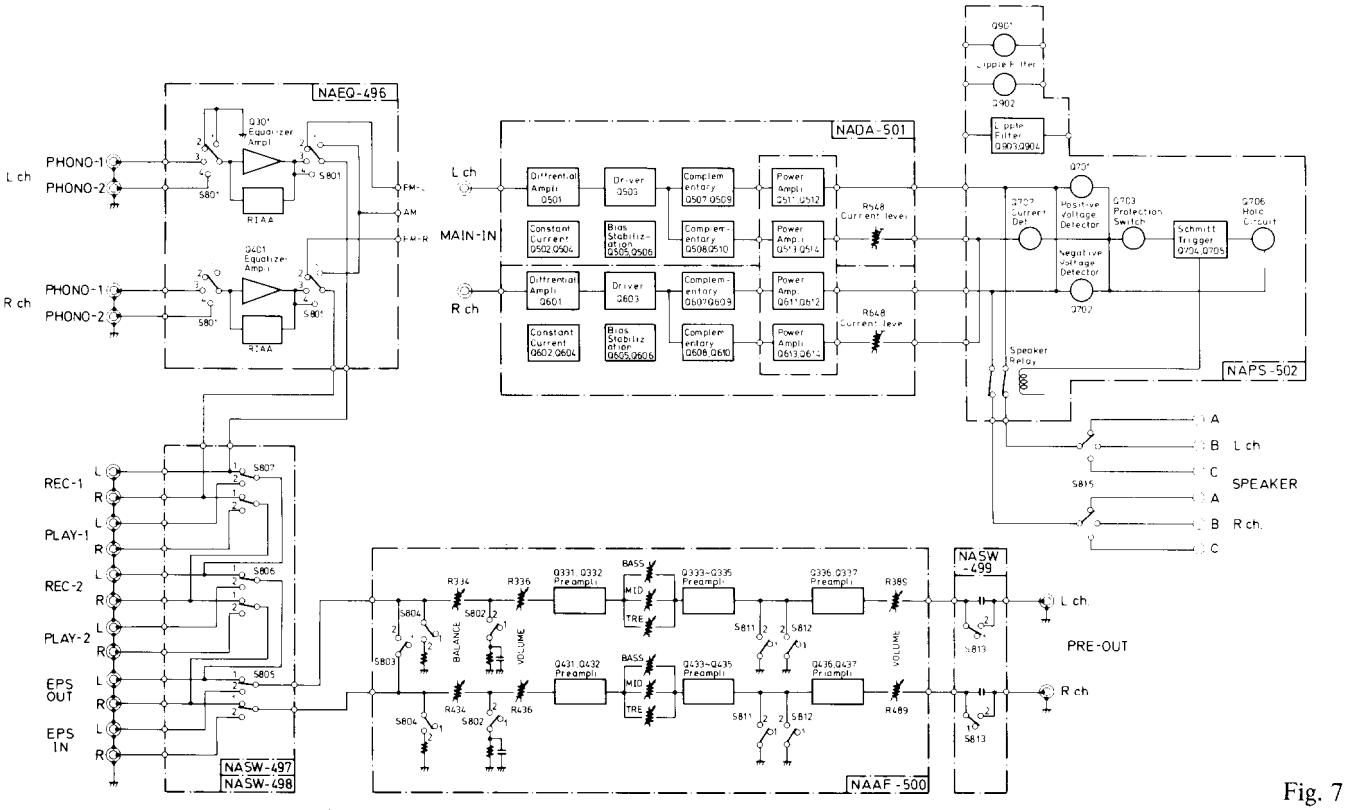


Fig. 7

SWITCH

S801 (SELECTOR)	: 1-AM, 2-FM, 3-PHONO 1, 4-PHONO 2
S802 (LOUDNESS)	: 1-OFF, 2-ON
S803 (MODE)	: 1-STEREO, 2-MONO
S-804 (AUDIO MUTING)	: 1-OFF, 2-ON
S805 (DUBBING)	: 1-TAPE 1 → TAPE 2, 2-TAPE 2 → TAPE 1
S806 (TAPE MONITOR-2)	: 1-OFF, 2-ON
S807 (TAPE MONITOR-1)	: 1-OFF, 2-ON
S808 (EXTERNAL PROCESSOR SWITCH)	: 1-OFF, 2-ON
S809 (MUTING LOCK)	: 1-ON, 2-OFF
S810 (DE EMPH)	: 1-75μSEC (50μSEC), 2-25μSEC.
S811 (HIGH FILTER)	: 1-OFF, 2-ON
S812 (LOW FILTER)	: 1-OFF, 2-ON
S813 (SUBSONIC)	: 1-ON, 2-OFF
S815 (SPEAKERS)	: 1-OFF, 2-A, 3-B, 4-C, 5-A+B, 6-A+C
S816 (HUM SENSOR)	: 1-LOW, 2-NORMAL, 3-HIGH
S901 (POWER)	: 1-OFF, 2-ON

CIRCUIT DESCRIPTION

1. PROTECTION CIRCUIT

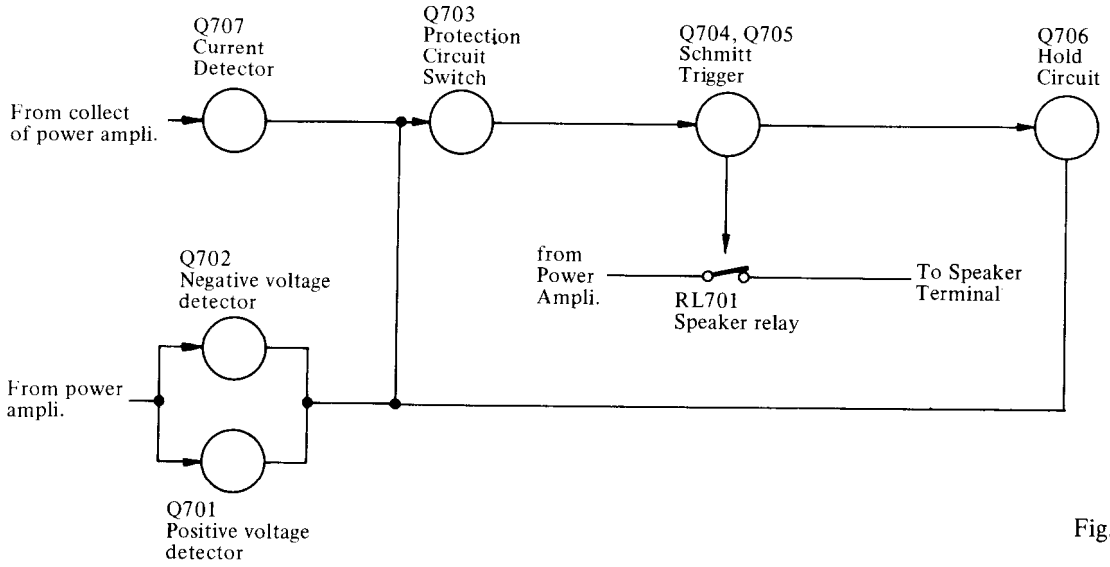


Fig. 8

The protection circuit is operated:

(1) when the B circuit is unstable when the power is turned ON (approximately 5 seconds)

(2) when the speaker terminals are shorted and abnormal current has flowed in the power amplifier thru this low impedance.

(3) when the center voltage has increased because of trouble at the differential amplifier, etc.

When Q703 is turned on by voltage detection or current detection, Q704 is turned ON by the voltage drop across R708. Q704, Q705 constitute a digitalized, fast response Schmitt trigger circuit. When Q704 is turned ON, Q705 is turned OFF. Q705 is a relay drive transistor. When it is turned OFF, the relay is also turned OFF.

When the power switch is turned ON, charging current flows thru the loop R709 → C702 → R707 → R708 and Q704 is turned ON by the voltage drop across R708. Consequently, Q705 and the relay are turned OFF until the charging current drops below a certain value. When the power switch is turned OFF, the B voltage falls and C702 is quickly discharged thru the loop R709 → C702 → D701. During normal operation, C702 is charged to almost the B voltage. But since the saturation resistance of Q703 is sufficiently low, when Q703 is turned ON, C702 is quickly discharged thru the loop R709 → C702 → Q703 and the realy is also turned OFF. The relay is not rurned ON again thereafter until C702 is charged, ever if the set should return to normal and Q703 is turned OFF.

Hold Circuit

The reference voltage is produced by R715, R716, Q706 is operated as a comparator. When Q705 has been turned OFF, the collector voltage of Q705 rises and C702 is charged. Therefore,when C702 is charged to above a certain voltage relative to the reference voltage at the junction of R715 and R716, Q706 is turned ON, Q703 is turned ON thru R717 and the circuit is held.

Current Detector

Q707 is turned ON by the voltage detected from the collecor circuit of the power amplifier. C704 prevents erroneous operation.

When the impedance is low at a certain frequency of the speaker, the protection circuit may be unexpectedly actuated each time a large audio signal of that frequency has entered. However, when this occurs the relay is opened and the power amplifier current returns to normal. The power amplifier current is also automatically returned to normal in a like manner when the load has been inadvertently shorted momentarily. When connected with the load shorted, the relay is repeatedly turned ON and OFF in load short – relay OFF (no load) – automatic reset (load short current detection) – relay. OFF order. Since the OFF time is sufficiently longer than the relay ON time in this case, the voltage across C703 gradually increases until a voltage sufficient to turn Q706 is reached, at which time the relay is held OFF, thus protecting the poeer transistor against damage by a continuous overcurrent.

2. QUARTZ LOCKED CIRCUIT

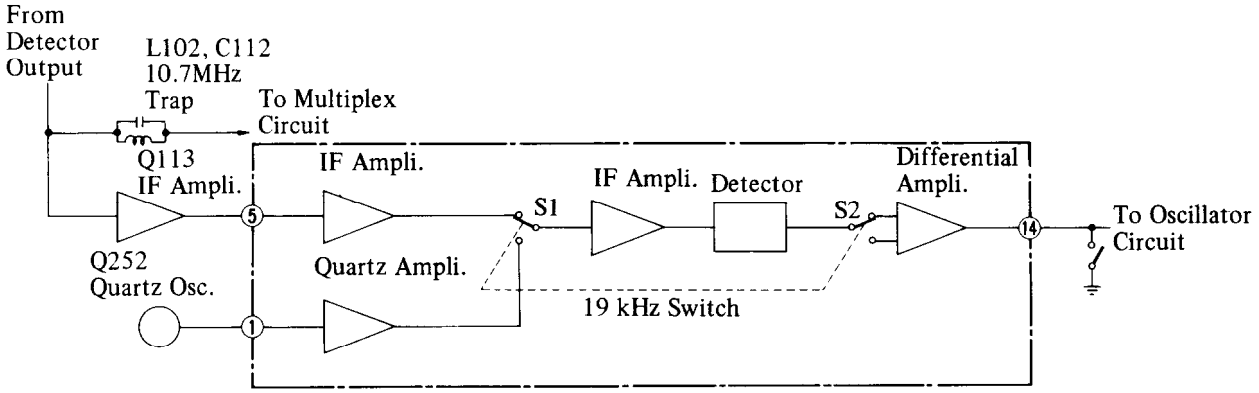


Fig. 9

The quartz locked circuit compares the frequency difference between the 10.7MHz reference signal and the IF signal, the difference being used to subsequently drive the AFC circuit.

A 10.7MHz component is extracted from the quadrature detector output by the L102 trap, amplified by the Q104 IC, and applied to pin no. 5 of the Q251 IC. An accurate 10.7MHz reference signal is generated by the quartz oscillator, and applied to pin no. 1 of the same IC. A 19kHz square wave is obtained from pin no. 10 of the PLL IC, and applied to pin no. 3 of Q251. The IF signal and the quartz oscillator reference signal are switched back and forth in a 19kHz cycle, and passed on to the detector and amplification stages. When S1 and S2 and both connected to the IF signal line, the IF frequency is detected, resulting is the generation of a voltage whose level corresponds to the IF frequency. This voltage is then applied to one of the differential amplifier inputs. When S1 and S2 are then both switched across to the quartz oscillator signal line, the quartz oscillator reference signal is detected, converted into the corresponding voltage, and applied to the other input of the differential amplifier. The difference between the IF detector DC component and quartz oscillator detector component is then amplified, appearing at pin no. 14 of the IC. This voltage serves as the AFC circuit control voltage. Any slight drift or deviation in the detector transformer will therefore result in the same amount of drift in both lines, thereby maintaining a constant difference. Precise local oscillator frequency will thus be kept at all times.

3. TUNING METER CIRCUIT

The tuning meter circuit compares the DC component difference between the quartz oscillator signal and IF signal detector outputs, and drives the tuning meter in accordance to this difference. The Q253 transistor is designed to short circuit the tuning meter when the input signals are weak.

4. MUTING CITCUIT

The muting circuit is activated by the combined effects of the IF component, noise component, and zero cross detector output. The IF level detector circuit is incorporated in the quadrature IC, the output appearing at pin no. 12. This pin is switched to high level when the IF level drops below the muting level, but is switched back to low level when the IF level exceeds the muting level again. The detection of noise above 100kHz in the composite signal will also result in pin no. 12 being switched to high level. Furthermore, the output of the zero cross detector (which compares the difference between the IF detector DC component and quartz oscillator detector DC component) will be at low level when a station is tuned, and at high level when turning away from the station, the switching point being several

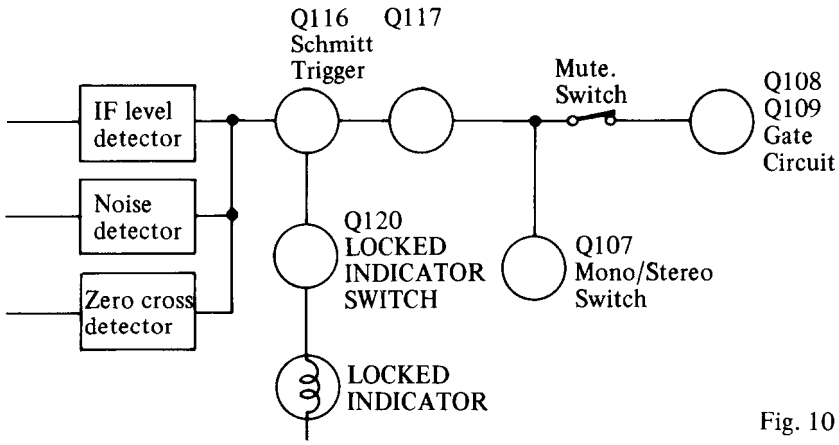


Fig. 10

kHz away from the exact tuning frequency. Consequently, when all detector circuit outputs are switched to low level, the Q116 transistor is cut off, and the Q120 transistor turned on, followed by the LOCKED lamp turning on. At the same time, Q117 is also turned on, and Q107 turned off, resulting in the STEREO lamp turning on (if the tuned station is broadcasting in stereo). Q108 and Q109 are also turned off, resulting in the appearance of an FM broadcast output signal at the receiver's output terminals.

5. AFC SWITCHING CIRCUIT

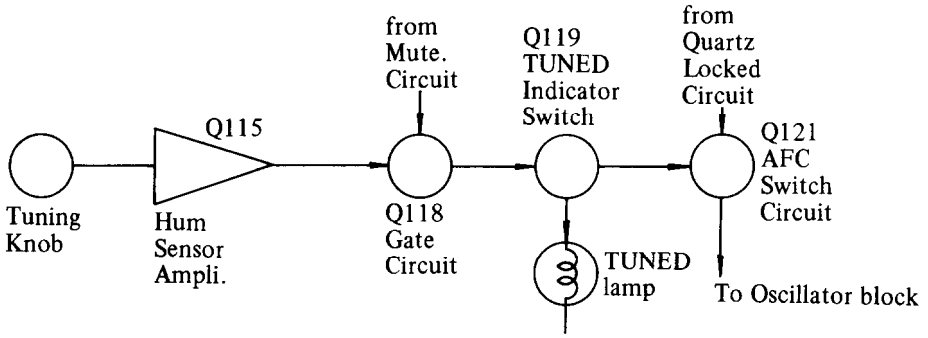


Fig. 11

In order to ensure accurate turning, the AFC circuit is turned off automatically once the tuning knob is touched, and also when the muting circuit is switched off.

When a station is tuned, Q118 will turn off and Q119 turn on (since Q116 will already be off and Q117 on), resulting in the LOCKED lamp turning on. And since Q121 will turn off when Q119 turns on, the AFC circuit will also begin to operate.

When the tuning knob is touched, a certain amount of hum is induced. This hum is amplified by Q115, rectified (full-wave) by D115 and D116 into a DC signal, and applied to Q118 is consequently turned on, resutling in the AFC circuit being switched off. If, however, the hum level is rather low, the LOCKED lamp might not turn on even when the tuning knob is touched. If this happens, reset the rear panel sensor switch to either the Normal or High positions.

ALIGNMENT PROCEDURES

INSTRUMENTS REQUIRED

1. DC Voltmeter
2. AM Sweep Generator
3. AM/FM Signal Generator
4. AC VTVM
5. Oscilloscope
6. Monitorscope
7. Distortion Analyzer
8. Stereo Modulator
9. Frequency Counter

GENERAL ALIGNMENT CONDITIONS

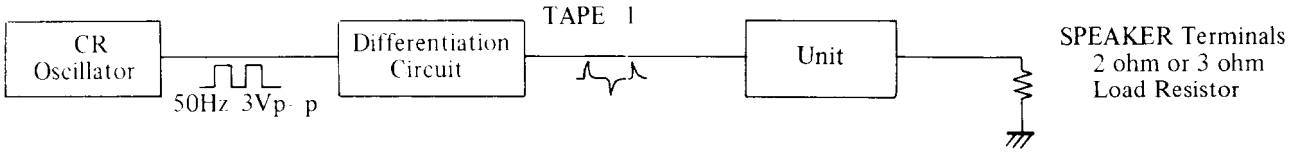
1. Signal input should be kept as low as possible.
2. Standard modulation is 400Hz 30% (AM), 1kHz 100% (FM MONO), pilot 9% sub and main 91% (FM STEREO).
3. Standard knob position

SPEAKERS	A
BASS, TREBLE & BALANCE	Center
HIGH FILTER	OFF
MODE	STEREO
DE-EMPHA	NORMAL
LOUDNESS	OFF
MUTING LOCK	OFF
TAPE 1, 2	OFF (SOURCE)

(1) IDLING CURRENT ADJUSTMENT

Connect the DV Voltmeter between ID and CT terminals.
Adjust the voltage to 40±10mV with R23
NOTES: Adjust after switching on for 5 minutes.
Open load VOLUME . . . . . Minimum
TAPE MONITOR-1 . . . . . ON

(2) CURRENT DETECTOR CIRCUIT CHECK



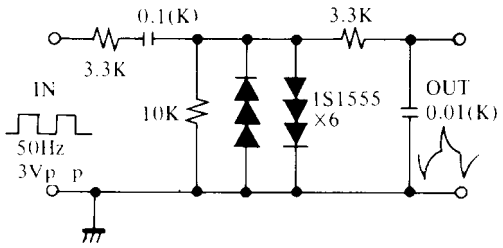


Fig. 12 Differentiation Circuit

Apply a tone burst signal to the TAPE-1 terminals. Connect a 2Ω hollow resistor to the speaker terminals, and adjust variable resistor R48 so that the relay is operated at maximum volume. Connect a 3Ω hollow resistor to the speaker terminals. Confirm the relay is not operated at maximum volume.

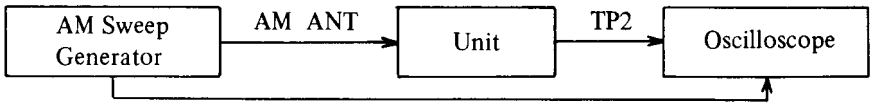
. NOTES: Adjust after switching on for 5 minutes.
VOLUME – Maximum

(3) CENTER VOLTAGE CHECK

When the transistor of the differential amp of the power amplifier or the constant current circuit has been replaced, check the center voltage.
Connect a DC VTVM between the CT-E terminals and check if the reading of the DC VTVM is within ±50mV.
Perform this check 5 minutes after the power switch has been set to ON..

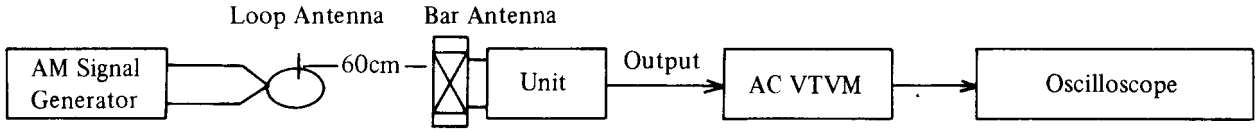
(4) AM IF ALIGNMENT

1. Set SELECTOR switch to AM.
2. Set radio dial to quiet point.



Set signal	Adjust	Oscilloscope	Remarks
455kHz	X103	Maximum Symmetrical Response	Usually not necessary to adjust

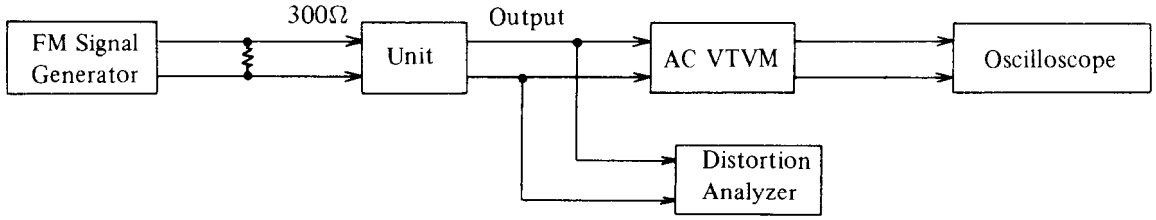
(5) AM RF ALIGNMENT



Step	Set Signal	Set Radio Dial	Adjust	VTVM reading	Remarks
1	515kHz 400Hz 30%	Lower end (515kHz)	L107	Maximum	Repeat steps 1 and 2 as necessary
2	1680kHz 400Hz 30%	Upper end (1680kHz)	TC4	Maximum	
3	600kHz 400Hz 30%	600kHz	L001 L108	Maximum	Repeat steps 3 and 4 as necessary
4	1400kHz 400Hz 30%	1400kHz	TC6 TC2	Maximum	

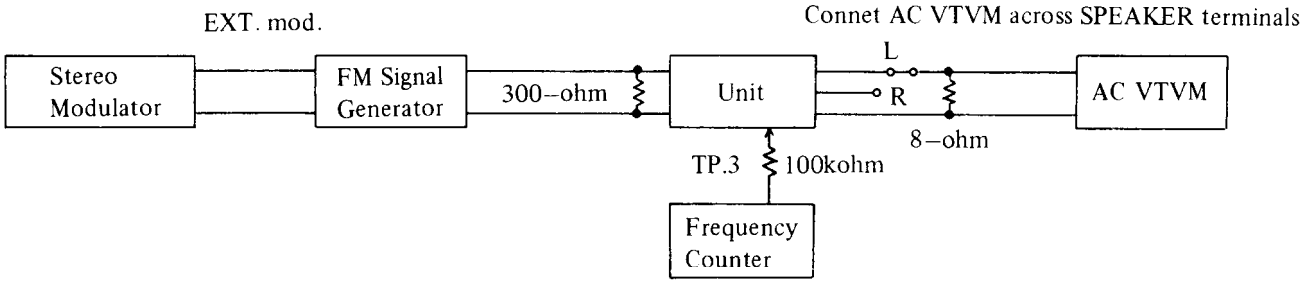
(6) FM FRONT END ALIGNMENT

1. Set SELECTOR switch to FM.
2. Connect FM Signal Generator to 300–ohm antenna terminals.



Step	FM Signal Generator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
1	No signal	Quiet Point	T101 Bottom	Tuning Indicator	Center	Repeat Steps 1 and 2 as necessary
2	98MHz 65dBf (60dB) 1kHz 75kHz devi.	98MHz	T101 Top	Distortion Analyzer	Minimum	
3	90MHz 65dBf (60dB) 1kHz 75kHz devi.	90MHz	L6	Tuning Indicator	Center	Repeat Steps 3 and 4 as necessary
4	106MHz 65dBf (60dB) 1kHz 75kHz devi.	106MHz	TC7		Center	
5	90MHz 20dBf (15dB) 1kHz 75kHz devi.	90MHz	L1 L2 L3	AC VTVM or Oscilloscope	Maximum	Repeat Steps 5 and 6 as necessary
6	106MHz 20dBf(15dB) 1kHz 75kHz devi.	106MHz	TC1 TC3 TC5		Maximum	
7	98MHz 65dBf(60dB) 1kHz 75kHz devi.	98MHz	L5	Distortion Analyzer	Minimum	

(7) MULTIPLEX ALIGNMENT



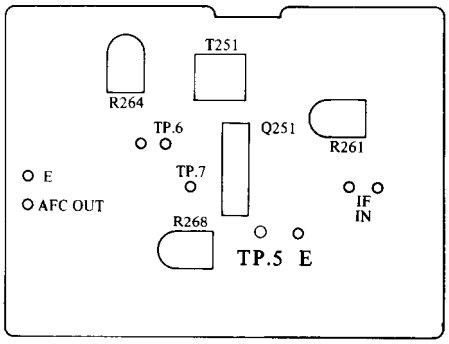
Step	FM Signal Generator	Stereo Modulator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
1	98MHz no mod. 65dBf (60dB)	–	98MHz	R125	Frequency Counter	19000±19Hz	
2	STEREO INDICATOR should light up when stereo program is being received.						
3	98MHz EXT. Mod. 65dBf (60dB)	Pilot Sig. 9% Main & Sub Sig. 1KHz Lch 91%	98MHz	R142	AC VTVM Right ch.	Minimum	Repeat Steps 3 & 4 as necessary Same separation
4	Same as above	Pilot Sig. 9% Main & Sub Sig. 1KHz Rch 91%	98MHz	R142	AC VTVM Left ch.	Minimum	

(8) QUARTZ LOCKED CIRCUIT ALIGNMENT

1. Connect the signal generator to the ANTENNA terminals and the DC voltmeter to the detector output (pin nos. 10).
2. Set the SG output to 98MHz, 1kHz, 75kHz div. 65dBf (60dB).
3. Tune the receiver to 98MHz.
4. Adjust the voltage to 3.5V with a detector coil of T251.

(9) TUNING METER CENTER ADJUSTMENT

1. Connect the signal generator to the ANTENNA terminals and the DC voltmeter to the detector output (pin nos. 10).
2. Set the SG output to 98MHz, 1kHz, 75kHz div. 65dBf (60dB).
3. Tune the receiver to 98MHz.
4. Place a short circuit across TP6 (pin nos. 10 and 11).
5. Adjust the semi-fixed resistor R261 to bring the tuning meter needle to dead center.
6. Then adjust the semi-fixed resistor R268 to bring the TP7 (pin no. 14) output voltage (AFC output) to zero.

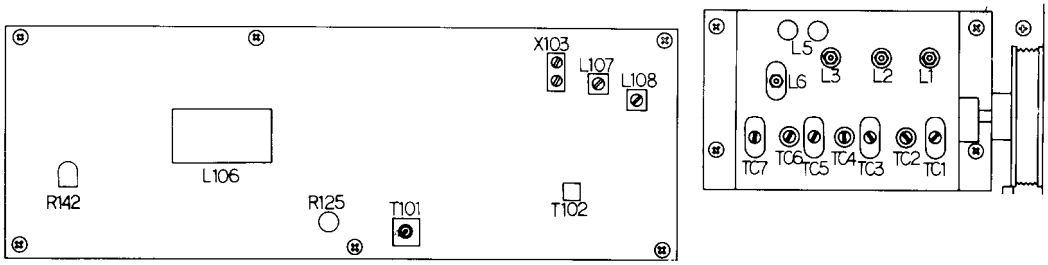


Adjustment point

Fig. 13

(10) SYNCHRONIZING THE LOCKED FREQUENCY WITH THE IF FREQUENCY

Adjust the semi-fixed resistor R264 to bring the TP7 output voltage to zero.



STRINGING DIAGRAM

1. Close the variable capacitor complete and tie the dial cord to the spring of the drum.
2. Thread the dial cord in the direction of arrow from (1) to (3) and wind the dial cord three turns around the tuning shaft clockwise.
3. Wind the dial cord 1½ turns around the dial drum.
4. Thread the dial cord to the dial pulley 3.

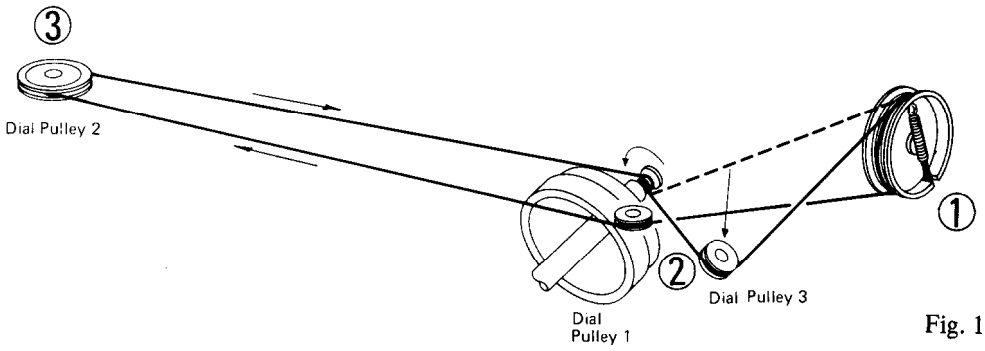
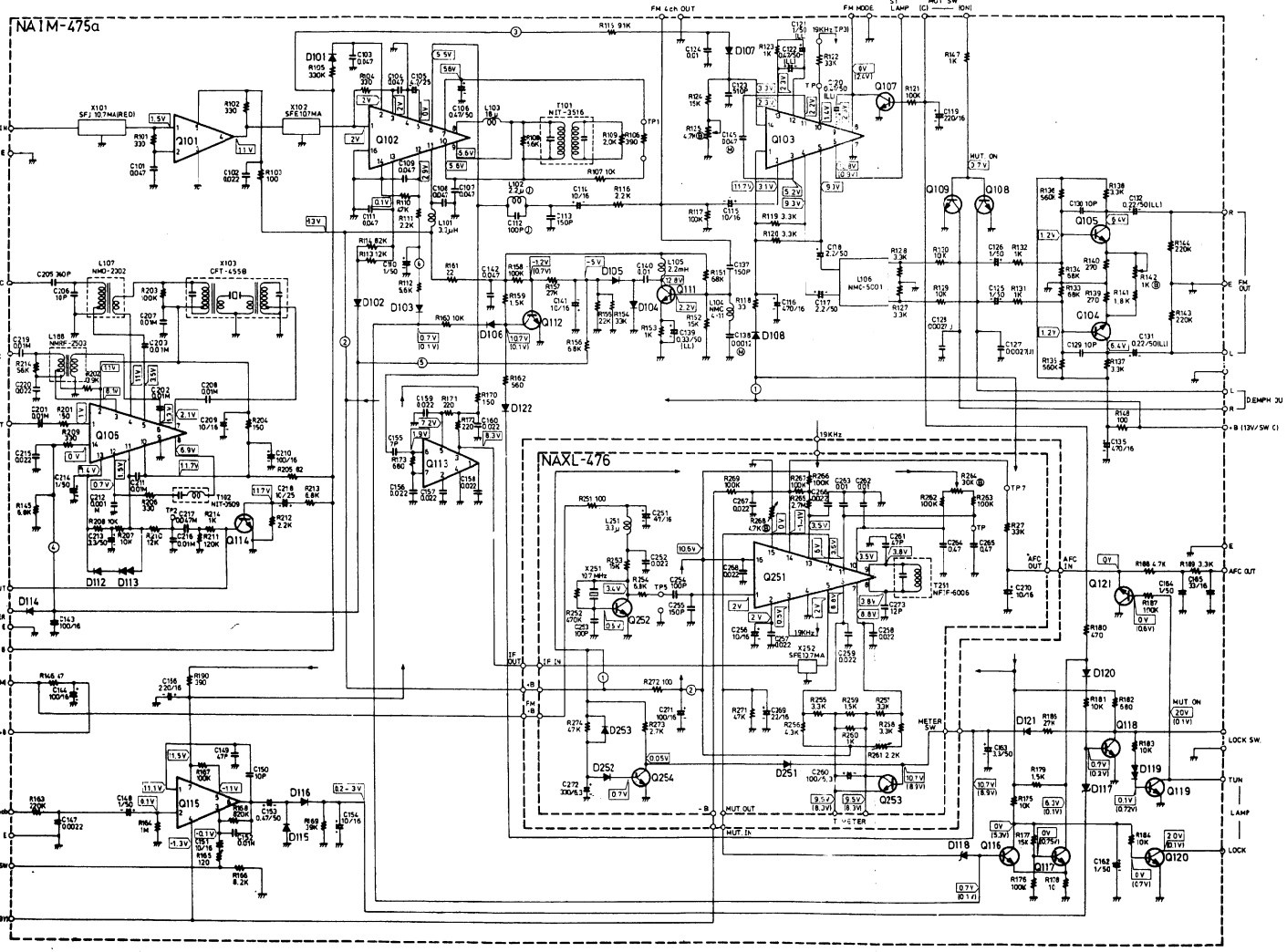


Fig. 14

AM/FM TUNER SCHEMATIC DIAGRAM

Model TX-6500MKII

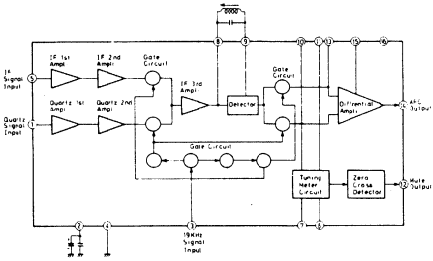


Q101----------TA7060P
Q102----------HA1137
Q103----------HA1156W
Q104, Q105-------2SC1312(F)
Q106----------HA1151
Q107, Q114, Q254---2SC945(L)Q1 or 2SC945(K)Q1
Q108, Q109, Q120---
Q121, Q253-------2SC1317(R)
Q111, Q112-------2SC733(BL)
Q113----------BA402
Q115----------TA7136P
Q116, Q117, Q118---
Q119----------2SC1317(R) or 2SC1815(Y)
Q251----------BA661
Q252----------2SC380(O)

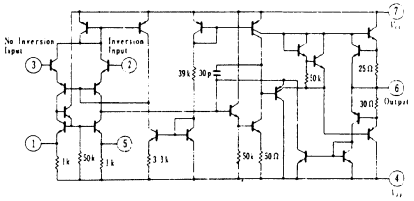
D101, D103, D106, D107, D108, D112, D120, D251, D252, D253 ---------- 1S1555
D102, D104, D105, D114, D115, D116 ---------- 1N60
D121, D122 ----------
D113, D119 ---------- VD1212
D117 ---------- YZ047
D118 ---------- WZ052

NOTES:
- ALL RESISTORS ARE IN OHMS, ¼ WATT UNLESS OTHERWISE NOTED.
- ALL CAPACITORS ARE IN μF, 5000WV UNLESS OTHERWISE NOTED.
- ELECTROLYTIC CAPACITORS (+|−) ARE IN μF/WV.
- VOLTAGE (MEASURED WITH V.T.V.M.).
  (V) DC VOLTAGE (NO INPUT SIGNAL)
  (v) DC VOLTAGE (FM STEREO).
  LOCK/MUT SW. ON

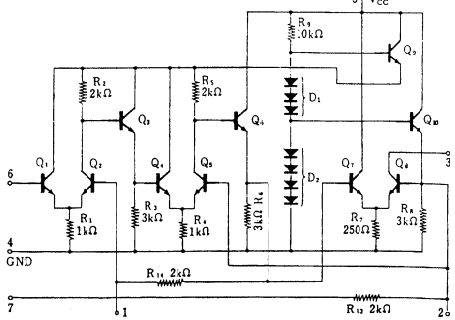
BA-661 BLOCK DIAGRAM



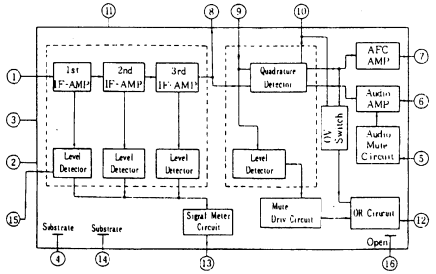
TA-7136P EQUIVALENT CIRCUIT



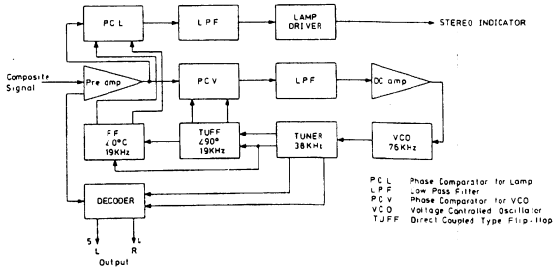
BA-402 EQUIVALENT CIRCUIT



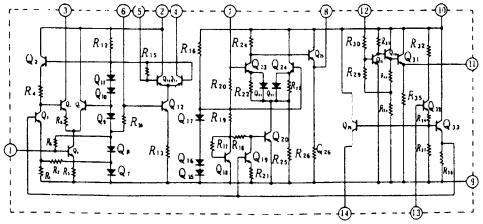
HA-1137 BLOCK DIAGRAM



HA-1156 BLOCK DIAGRAM



HA-1151 EQUIVALENT CIRCUIT



ONKYO CORPORATION

EQUALIZER AMPLI. PC BOARD (NAEQ-496) - PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	ICs	
Q301, Q401	222471	HA-1457
	Capacitors	
C301, C401	392880227	2.2μF, 50V, LL
C304, C404	352734701	47μF, 10V, Elect.
C311, C312	352780101	1μF, 50V, Elect.
	Switch	
S801	25030101	NRS-374-30A, Source selector

SWITCH PC BOARD (NASW-497) - PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Switches	
S805-S807	25035079	NPS-222-162L44, Dubbing/Tape-1/Tape-2
S808-S810	25035078	NPS-322-L43, EPS/Muting/De-empha.

SWITCH PC BOARD (NASW-499) - PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Capacitors	
C360, C460	372328214	820pF±5%, 50V, ST
C364, C464	352984796	0.47μF, 50V, NP
	Switch	
S811-S813	25035078	NPS-322-L43, Hi-filter/low filter/Subsonic filter

INDICATOR LAMP PC BOARD (NAPL-503) - PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Lamps	
PL806-PL812	210042	PL12V0.03A, AM/FM/PH-1/PH-2/STEREO/TUNED/LOCKED

DIAL ILLUMINATION LAMP PC BOARD (NAPL-474) - PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
P801	210039A	300mA, 8V Dial illumination lamp

FRONT END PC BOARD (FAT-52EJ-41) - PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Transistors	
Q1		3SK45 (B)
Q2		2SC535 (B)
	OSC Block	
	222013	F-15EA

NOTE Capacitor
ST: Polystyren film capacitor
NP: Non-polar electrolytic capacitor

POWER AMPLI. PC BOARD (NADA-501) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Transistors	
Q01	2211372	2SC2259G (0-002), Diffrential ampli.
Q02	2211414	2SC1627 (Y), Regulator current
Q03	2210772 or 2210774	2SA818 (O) or 2SA818 (Y) Driver
Q04	2210782 or 2210784	2SC1628 (O) or 2SC1628 (Y) Regulator current
Q05, Q06	2210746	2SC945A (P) Bias stabilization
Q07	2210782 or 2210784	2SC1628 (O) or 2SC1628 (Y) Complementary
Q08	2210772 or 2210774	2SA818 (O) or 2SA818 (Y) Complementary
Q09	2200863 or 2200864	2SC2238 (O) or 2SC2238 (Y) Complementary
Q10	2200873 or 2200874	2SA968 (O) or 2SA968 (Y) Complementary
Q11, Q12	2200802 or 2200803	2SD551 (R) or 2SD551 (O) Power ampli.
Q13, Q14	2200812 or 2200813	2SB681 (R) or 2SB681 (O) Power ampli.
	Diodes	
D01, D05	223105	1S1555
D02	224042 or 223928	05Z6.2-L or WZ061 Zener
D03, D04	4000031	M8513A (O)
	Coil	
L01	231001	S-1.3B
	Capacitors	
C01	392851007	10μF, 25V, LL
C03	352743311	330μF, 16V, Elect.
C12	352744701	47μF, 16V, Elect.
C17	374136835	68,000μF±10%, 100V, DE
C22	352771001	10μF, 63V, Elect.
C26	352771001	10μF, 63V, Elect.
C29	352780101	1μF, 50V, Elect.
	Resistors	
R14	441721534	15kΩ, 2W, MOF
R20	4000003	D22A, Themistor
R23	5221019	N10HR470BE, SF
R26	451631004	10Ω, 1W, Metal
R27, R28	441628204	82Ω, 1W, MOF
R29	451631004	10Ω, 1W, Metal
R30-R33	451630274	2.7Ω, 1W, Metal
R34, R35, R38, R39	4000035	0.47Ω, 5W, Cement
R40-R43	4000034	0.33Ω, 5W, Cement
R45	451731004	10Ω, 2W, Metal
R46	451630564	5.6Ω, 1W, Metal
R48	5221007	R.HK2-2KB3S, SF
R51	4000003	D22A, Themistor
	Radiators	
	27160011	RAD-05
	Pan head screws	
	82113008	3P+8F-N
	Nuts	
	863130	N-3F-N

RECTIFIER AND PROTECTION CIRCUIT PC BOARD (NAPS-502) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Transistors	
Q701	2211255 or 2210746	2SC1815 (GR) or 2SC945A (P)
Q702	2211255 or 2210746	2SC1815 (GR) or 2SC945A (P)
Q703	2211395 or 2211803	2SA970 (GR) or 2SA733 (P)
Q704	2211255 or 2210746	2SC1815 (GR) or 2SC945A (P)
Q705	2211163 or 2211164	2SC2120 (O) or 2SC2120 (Y)
Q706	2211255 or 2210746	2SC1815 (GR) or 2SC945A (P)
Q707	2211405 or 2211406	2SC2240 (BL) or 2SC2240 (GR)
Q901	2200673 or 2200674	2SA816 (O) or 2SA816 (Y)
Q902	2200663 or 2200664	2SC1626 (O) or 2SC1626 (Y)
Q903	2200013 or 2200014	2SD235 (O) or 2SD235 (Y)
Q904	2211254 or 2211255	2SC1815 (Y) or 2SC1815 (GR)
	Diodes	
D701-D704	223105	1S1555
D902, D903	224069 or 224079	05Z22-U or WZ220 Zener
D904	223853	MI-151
D906	223802	1S1885
	Capacitors	
C701	352724711	470μF, 6.3V, Elect.
C702	352752201	22μF, 25V, Elect.
C703	352741011	100μF, 16V, Elect.
C909, C910	352782211	220μF, 50V, Elect.
C911, C912	352751011	100μF, 25V, Elect.
C913, C914	352752211	220μF, 25V, Elect.
C918	352751011	100μF, 25V, Elect.
C919	352751021	1,000μF, 25V, Elect.
C920	352753311	330μF, 25V, Elect.
C921	352744701	47μF, 16V, Elect.
C922	352741011	100μF, 16V, Elect.
	Resistors	
R713	441621214	120Ω, 1W, MOF
R904, R907	441622714	270Ω, 1W, MOF
	Fuse	
F902	252014	4A-T, Lamp
	Fuseholder	
F902a	250113	SN5051
	Relay	
RL701	250166 or 25065037	NRS-2P5A-DC12 or NRL-2P5A-DC12-02
	Radiators	
	27160011	RAD-05

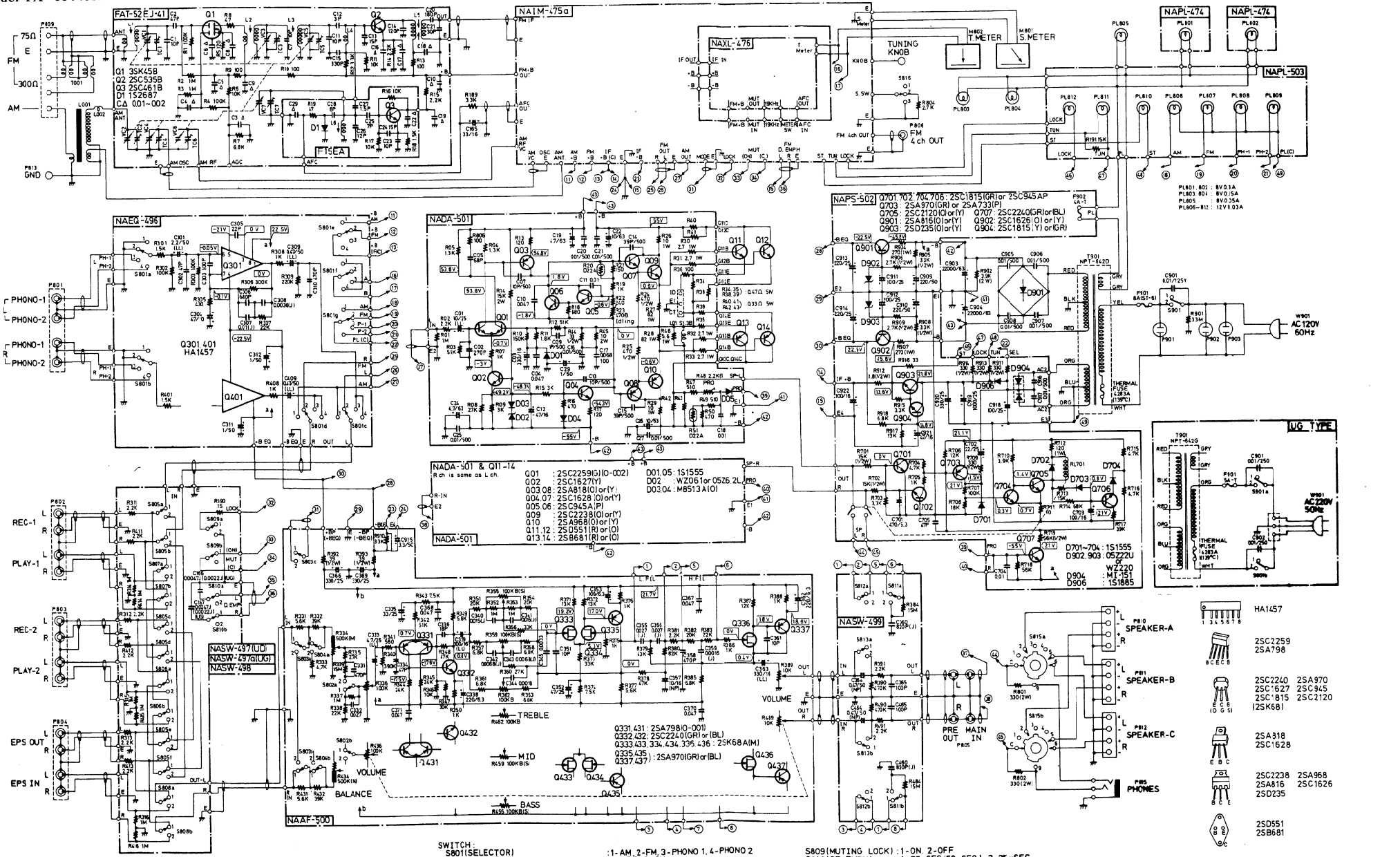
CAUTION: Replacement for power, complementary and driver transistors, if necessary, must be made from the same beta group (h_{FE}) as the original type.

NOTES: Capacitors
- LL: Low leakage current type electrolytic capacitor
- DE: Non-inductive polyester film capacitor

Resistors
- MOF: Metal oxide film resistor
- SF: Semi-fixed variable resistor

SCHEMATIC DIAGRAM

Model TX-6500MKII



Q1 3SK45B
Q2 2SC535B
Q3 2SC461B
D1 1S2687
CΔ 0.01-002

Q301.401 HA1457

Q401

NADA-501 & Q11-14
Rch is same as Lch.

Q01 : 2SC2259(G)(O-002)
Q02 : 2SC1627(Y)
Q03.08 : 2SA818(O) or(Y)
Q04.07 : 2SC1628(O) or(Y)
Q05.06 : 2SC945A(P)
Q09 : 2SC2238(O) or(Y)
Q10 : 2SA968(O) or(Y)
Q11.12 : 2SD551(R) or(O)
Q13.14 : 2SB681(R) or(O)

D01.05 : 1S1555
D02 : WZ061or 0526.2L
D03.04 : M8513A(O)

Q701.702.704.706 : 2SC1815(GR) or 2SC945AP
Q703 : 2SA970(GR) or 2SA733(P)
Q705 : 2SC2120(O) or(Y)
Q707 : 2SC2240(GR) or(BL)
Q901 : 2SA816(O) or(Y)
Q902 : 2SC1626(O) or(Y)
Q903 : 2SD235(O) or(Y)
Q904 : 2SC1815(Y) or(GR)

D701-704 : 1S1555
D902.903 : 05Z22U
D904 : WZ220
D906 : MI-151
1S1885

PL801.802 : 8V0.1A
PL803.804 : 8V0.15A
PL805 : 8V0.35A
PL806-812 : 12V0.03A

Q331.431 : 2SA798(O-001)
Q332.432 : 2SC2240(GR) or(BL)
Q333.433.334.434.335.436 : 2SK68A(M)
Q335.435
Q337.437 : 2SA970(GR) or(BL)

Q431 Q432 Q433 Q434 Q435 Q436 Q437

HA1457
2SC2259 2SA798
2SC2240 2SA970 2SC1627 2SC945 2SC1815 2SC2120 (2SK68)
2SA818 2SC1628
2SC2238 2SA968 2SA816 2SC1626 2SD235
2SD551 2SB681

NOTES:
- ALL RESISTORS ARE IN OHMS, 1/4 WATT UNLESS OTHERWISE NOTED.
- ALL CAPACITORS ARE IN μF, 50WV UNLESS OTHERWISE NOTED.
- ELECTROLYTIC CAPACITORS (—⊕—) ARE IN μF/WV.
- VOLTAGE (MEASURED WITH V.T.V.M) (NO SIGNAL INPUT).

SWITCH:

S801(SELECTOR)	:1-AM, 2-FM, 3-PHONO 1, 4-PHONO 2
S802(LOUDNESS)	:1-OFF, 2-ON
S803(MODE)	:1-STEREO, 2-MONO
S804(AUDIO MUTING)	:1-OFF, 2-ON
S805(DUBBING)	:1-TAPE 1→TAPE 2, 2-TAPE 2→TAPE 1
S806(TAPE MONITOR-2)	:1-OFF, 2-ON
S807(TAPE MONITOR-1)	:1-OFF, 2-ON
S808(EXTERNAL PROCESSOR SWITCH)	:1-OFF, 2-ON
S809(MUTING LOCK)	:1-ON, 2-OFF
S810(DE EMPH)	:1-75μSEC.(50μSEC.), 2-25μSEC.
S811(HIGH FILTER)	:1-OFF, 2-ON
S812(LOW FILTER)	:1-OFF, 2-ON
S813(SUBSONIC)	:1-ON, 2-OFF
S815(SPEAKERS)	:1-OFF, 2-A, 3-B, 4-C, 5-A+B, 6-A+C
S816(HUM SENSOR)	:1-LOW, 2-NORMAL, 3-HIGH
S901(POWER)	:1-OFF, 2-ON

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